

Development of a Hydrogel Matrix for Stem Cell Growth and Neural Repair after Stroke

Grant Award Details

Development of a Hydrogel Matrix for Stem Cell Growth and Neural Repair after Stroke

Grant Type: Tools and Technologies II

Grant Number: RT2-01881

Project Objective: This project is intended to develop a hydrogel to promote the survival and engraftment of NSCs to treat stroke and improve functional recovery.

Investigator:

Name:	Stanley Carmichael
Institution:	University of California, Los Angeles
Type:	PI

Disease Focus: Neurological Disorders, Stroke

Human Stem Cell Use: iPS Cell

Award Value: \$1,825,613

Status: Closed

Progress Reports

Reporting Period: Year 1

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Reporting Period: Year 3

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Grant Application Details

Application Title:	Development of a Hydrogel Matrix for Stem Cell Growth and Neural Repair after Stroke
Public Abstract:	<p>Stroke is the leading cause of adult disability. Most patients survive their initial stroke, but do not recover fully. Because of incomplete recovery, up to 1/3 of stroke patients are taken from independence to a nursing home or assisted living environment, and most are left with some disability in strength or control of the arms or legs. There is no treatment that promotes brain repair and recovery in this disease. Recent studies have shown that stem cell transplantation into the brain can promote repair and recovery in animal models of stroke. However, a stem cell therapy for stroke has not reached the clinic. There are at least three limitations to the development of a human stroke stem cell therapy: most of the transplanted cells die, most of the cells that survive do not interact with the surrounding brain, and the process of injecting stem cells into the brain may damage the normal brain tissue that is near the stroke site. The studies in this grant develop a novel investigative team and research approach to achieve a solution to these limits. Using the combined expertise of engineering, stem cell biology and stroke scientists the studies in this grant will develop tissue bioengineering systems for a stem cell therapy in stroke. The studies will develop a biopolymer hydrogel that provides a pro-growth and pro-survival environment for stem cells when injected with them into the brain. This approach has three unique aspects. First, the hydrogel system utilizes biological components that mimic the normal brain environment and releases specific growth factors that enhance transplanted stem cell survival. Second, these growth factors will also likely stimulate the normal brain to undergo repair and recovery, providing a dual mechanism for neural repair after stroke. Third, this approach allows targeting of the stroke cavity for a stem cell transplant, and not normal brain. The stroke cavity is an ideal target for a stroke stem cell therapy, as it is a cavity and can receive a stem cell transplant without displacing normal brain, and it lies adjacent to the site in the brain of most recovery in this disease—placing the stem cell transplant near the target brain region for repair in stroke.</p> <p>The progress from stroke stem cell research has identified stem cell transplantation as a promising treatment for stroke. The research in this grant develops a next generation in stem cell therapies for the brain by combining new bioengineering techniques to develop an integrated hydrogel/stem cell system for transplantation, survival and neural repair in this disease.</p>
Statement of Benefit to California:	<p>Advances in the early treatment of stroke have led to a decline in the death rate from this disease. At the same time, the overall incidence of stroke is projected to substantially increase because of the aging population. These two facts mean that stroke will not be lethal, but instead produce a greater number of disabled survivors. A 2006 estimate placed over half of the annual cost in stroke as committed to disabled stroke survivors, and exceeding \$30 billion per year in the United States. The studies in this grant develop a novel stem cell therapy in stroke by focusing on one major bottleneck in this disease: the inability of most stem cell therapies to survive and repair the injured brain. With its large population California accounts for roughly 24% of all stroke hospital discharges in the United States. The development of a new stem cell therapy approach for this disease will lead to a direct benefit to the State of California.</p>

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